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Background and Developement of Vessel Traffic Services in Finland

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Esipuhe

VTS-toiminta on Suomessa vielä nuorta, vaikka kehittyykin koko ajan isoin askelin.

Ensimmäinen VTS-keskus aloitti 1996.

Minulla on ollut ilo olla alusta alkaen mukana kehittämässä Suomen VTS-järjestelmää. Jäädessäni eläkkeelle vuoden 2002 alusta haluan tallentaa tietoni ja kokemukseni Suomenlahden VTS:n toteuttamisesta paperille. Tästä syystä pyysin hyvää ystävääni, kansainvälisesti tunnettua ja tunnustettua VTS-asiantuntijaa, merikapteeni Terry Hughesia avukseni kirjoittamaan tämän kirjasen. Hughes kertoo VTS:n kansainvälisestä kehityksestä ja toiminnasta ja oma osani rajoittuu niihin kokemuksiin, joita minulla on Suomenlahden merenkulkupiirin VTS:n rakentamisesta.

VTS-järjestelmän kehittäminen jatkuu koko ajan. Tulevaisuuden visioista mainittakoon mm. suunnitelma rakentaa yhdessä muiden merellisten viranomaisten kanssa yksi koko Suomenlahden alueen kattava keskus, joka toivon mukaan olisi toiminnassa vuonna 2004. Samassa keskuksessa toimisi myös VTMIS, jota ylläpidettäisiin yhdessä Venäjän ja Viron viranomaisten kanssa.

Kirjasen kirjoittaja Terry Hughes on monessa merenkulkualan järjestössä toimiva niin tutkanavigoinnin, VTS:n kuin simulaattorikoulutuksenkin asiantuntija ja merenkulkupiireissä hyvin tunnettu luennoitsija. Hän on toiminut lehtorina Southamptonin merenkulkuoppilaitoksessa. Osa maamme VTS-henkilöstöä ja VTS:stä vastaavia on ollut hänen koulutuksessaan.

Elokuu 2001

Dieter Müntzel
Liikennetoimialan päällikkö

Foreword

The idea of this Booklet for all those involded in the Finnish VTS, was conceived in the finest of Finnish traditions, in a Finnish Sauna!

The original idea was conceived by Captain Dieter Müntzel, who is Head of the Traffic Division in the Gulf of Finland. Just under a year ago I was enjoying some wonderful Finnish hospitality, including a Sauna, when Dieter asked me if I would write this Booklet.

It has been quite a task, as it has never been done before. My thanks must go to Dieter for putting the suggestion to me and also for providing the historical side of *VTS in Finland* and to my wife Karen who has been tolerant enough to allow me to spend hours in front of my computer.

I hope that all who read this Booklet will find it interesting and helpful.

VTS in Finland is going from strength to strength and the Finnish Maritime Authority is fast becoming a leading VTS Authority.

My best wishes also go to Dieter in his Retirement. He has worked very hard for VTS in general and the Gulf of Finland VTS in particular.

June 2001

Captain Terry Hughes, FNI FRIN

CONTENTS

INTERNATIONAL DEVELOPMENT of VTS

Maritime traffic is managed by means of Vessel Traffic Services (VTS). Such services have been introduced by port authorities and coastal states over the last fifty years, as a way of helping to improve the safety of shipping, increase traffic throughput and reduce risk of pollution.

In the summer of 1946, the British Admiralty in conjunction with the Mersey Docks and Harbour Board carried out experiments with naval radar equipment set up ashore at Liverpool. The demonstration confirmed the potential usefulness of shore-based radar. Similar experiments were carried out at Southampton, Halifax (Nova Scotia), Le Havre (France) and Long Beach (USA).

The world's first harbour control radar was actually installed at the end of Victoria Pier, Douglas, Isle of Man. Air Vice-Marshall Sir Geoffrey Rhodes Bromet, KBE CB DSO, who was Lieutenant Governor of the Island at the time, inaugurated it on 27 February 1948. The system was manufactured and installed by Cossor Radar Ltd.

In the same year, the Sperry Gyroscope Company together with AC Cossor Ltd. installed the world's first specially designed port radar system at the Port of Liverpool. The First Sea Lord Sir John HD Cunningham, GCB MVO, inaugurated it on 27 July. Sir Thomas AL Brocklebank, Bart, Chairman of the Mersey Docks and Harbour Board, had taken considerable interest in the radar project from its original conception.

In 1951, Long Beach in California established a radar and vhf to facilitate port operations. Le Havre also established a system and so gradually, other ports followed. At this time commercial radar, which made it possible under almost all weather conditions to observe vessel traffic from the shore, was comparatively new. In combination with VHF radio, a traffic surveillance system was achieved and real time information exchange between the shore and ships became possible.

It was not until 1968, however, that the International Maritime Organization (IMO) adopted Resolution, A.158(ES.IV), *Recommendation On Port Advisory Services*, subsequently followed by Resolution A.587(14) in 1985, *Guidelines for Vessel Traffic Services*.

VTS in FINLAND

Even with this changing climate in the maritime world, Finland had already been taking a keen interest in the proceedings. Interest in VTS was awakened in 1985 when the IMO adopted the first Resolution on Vessel Traffic Services namely, A.578(14) "*Guidelines for Vessel Traffic Services*". In 1990 four Maritime Districts were formed, Gulf of Finland, South Western District, Gulf of Bothnia and Inland Waterways.

In July 1993 the Finnish Maritime Administration (FMA) Managers responsible for vessel traffic (Paavo Wihuri, Lars Stadius, Dieter Müntzel and Markku Mylly) had a

meeting as to how best progress VTS in Finland. Various visits were made to other leading maritime nations in Europe, to look at their VTS systems.

In September 1993 a major Shipping Conference was held aboard the *SILJA EUROPA*. All the Authorities involved in the Finnish shipping industry were present, including the Navy and Coast Guard. It was at this time that a Gulf of Finland task group was formed to study the vessel traffic situation at Helsinki. In December 1994 a joint Paper was produced presenting the findings of the Study.

In September 1995 a selected group of trainee Vessel Traffic Service Operators (VTSOs) and management personnel, attended a VTS course at Southampton, UK. Several groups followed this up over the next two years, including Pilots and the Radio Operators of Turku Radio.

It was at about this time that the Gulf of Finland and South Western Maritime Districts started installing radar systems for their respective VTS areas. Visits to UK VTS Centres of Southampton, Dover and London were instigated, to look at how the management and various personnel operated at those Centres. A final VTS course in Southampton was attended by FMA Managers involved in VTS.

In September 1996 the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) held an International Symposium in Rotterdam on VTS. It was at this Symposium that strong recommendations were made for IALA to look into the training of VTS Personnel. The first VTS in Finland was inaugurated in Helsinki on 1st October 1996.

In May 1998, IALA Recommendation V-103 ("*Standards of Training and Certification of VTS Personnel*") was adopted by the IALA Council.

VTS in Finland is still expanding, with a Centre soon to be to be set up in Hanko and the Gulf of Bothnia. Eventually the whole of Finland will be covered by VTS, which will provide complete continuity over its whole coastline. The Gulf of Finland is planning a new Centre in Helsinki which will encompass all the present VTS Centres into one control centre and also house Helsinki Port, the Navy and Coast Guard in one building. It is hoped to establish this Centre by 2004.

The Gulf of Finland is soon to become one of the busiest waterways in the world. The Ferry traffic is increasing between Finland and the other Baltic States and it is reported that Russia is soon to build new Oil Refineries on its western coast at Primorsk, Ost-Luga and Batareyanya. This will mean new Traffic Separation Zones being established in the Gulf of Finland so that the increased vessel traffic can be safely managed.

HARBOUR AUTHORITIES

Not all VTS Centres are managed by Port Authorities. In the UK, for example, the Maritime and Coastguard Agency oversees the Dover Straits and the Royal Navy operates the Portsmouth Harbour VTS (*QHM PORTSMOUTH*). In Sweden, the Port of

Göteborg and Harbour Master are managed by the City, whilst the Pilots and VTS are managed by the National Maritime Board.

In California there is a Vessel Traffic Information Service (VTIS), which is America's first and only joint government and private sector partnership. This joint-venture partnership includes the Marine Exchange of Los Angeles-Long Beach (a non-profit organization representing local commercial interests) and the US Coast Guard (USCG).

In the UK, Harbour Authorities have powers devolved by Parliament. These come with rights and duties, and an obligation to use them openly and accountably to the same standards as Government itself. Government must help by ensuring that procedures for revising statutory powers work efficiently so that they do not become a barrier to necessary change and improvement.

As a rule, it is for the Harbour Authority to change local powers and duties. This carries a duty to keep them up to date and suited to the current needs of the port and its users.

Ports and Harbours

Before commencing this section, it would be as well to give a general definition of a Harbour, a Port and a Strait.

A Harbour is a place on the coast where ships may moor or shelter.

A Port is a town or place alongside navigable water having a harbour with facilities for the loading or unloading of ships.

A Strait is any natural and narrow passage between two coasts, which provides communication between two parts of the sea.

The geography of an area plays an important part in the formation of a harbour or port. Some harbours are natural whilst others need to be constructed. Some ports can be several miles from the open sea, with vessels having to transit through large archipelagos to reach them.

The ports of Stockholm in Sweden and Helsinki and Turku in Finland are good examples of this, where large passenger ferries are navigationally challenged in their daily runs, with the passage between islands, some of which are just barely wide enough to allow the ships to pass safely. These route also becomes more hazardous in the winter, when the ships have ice to contend with, as well as the intricate navigation between the various islands.

Harbours normally have a Harbour Master in charge and Ports a Port Captain. However there appears to be no hard and fast rule to this. Dover is called 'Dover Harbour' and has a Harbour Master, whilst Helsinki is called the 'Port of Helsinki' and also has a Harbour Master in charge.

In the UK, the Government does not run the shipping industry or the ports industry. The Government does not decide the ports industry's commercial strategy, or direct or fund its investment; nor does it manage port operations. These are matters, which Parliament has entrusted to local statutory authorities, who fund their own investment and operations from levies on users. In general, the port infrastructure can and should be commercially financed.

There are some 500 Ports around the UK, each one being governed by its own local Act of Parliament and Byelaws, which set out the respective powers and duties.

These Ports are divided into four main groups namely:

1. Trust ports are independent statutory bodies established under local Acts of Parliament (Dover, London, Milford Haven)
2. Company Ports, which are owned by public or statutory companies (Southampton, Liverpool)
3. Municipal Ports which are owned and managed by local authorities (Portsmouth, Ramsgate, Sullom Voe)
4. State owned Ports, which are the responsibility of the British Waterways Board (Sharpness, Gloucester).

This variation in ownership can mean that a common performance standard is lacking, with individual Ports acting under their own operational guidelines. In adopting Resolution A.857 (20), the IMO recognised "*that the use of differing VTS procedures may cause confusion to Masters of vessels moving from one VTS area to another*".

Many ports were created to serve local markets and coastal shipping services. Some harbour authorities have never been concerned with commercial shipping. Ports should add value to their communities and to the wider economy, whether they are used for commercial shipping activities, for leisure activities, or both. This applies as much to publicly owned ports (Trust ports and Municipal ports) as it does to Commercial ports.

The Finnish Government together with the Maritime Administration regulates port operations in a number of ways. There are statutory requirements for the safety of those who work in ports. Port undertakings now have various obligations to help in the Government's fight against marine pollution. Ports policy aims to maintain a modern and efficient system of regulation, developed in consultation with all to whom it applies.

Port Legislation

Each port has local legislation that has been amended in an ad hoc basis over many years. Harbour Orders provide an easier means of revising local port legislation than Private Bills, but they too require specialist expertise. New duties tend to be overlaid on existing requirements to produce extremely complex procedures that hold up development and management. Although some larger ports have modern powers

that match those of any modern commercial enterprise, many others are still working round, rather than within, their legislation.

Byelaws and Directions adopted by Harbour Authorities should reflect a risk assessment of the area involved. They also need to be enforced effectively. Each Authority needs a clear policy on prosecution. Few apply much effort to enforcement or maintenance of byelaws. Resources are a real problem and specialist advice is not cheap. Penalties are also modest for byelaw offences generally, although offences such as dangerous navigation are potentially very serious.

In Lord Donaldson's Review, "*Salvage and Intervention, Command and Control*", he stated that: "*Harbour authorities also have other concerns: to promote the safety of navigation and to avoid any harm to the commercial operation of their port*". In fact most of the local Acts of Parliament governing the ports, include requirements to ensure that those responsible do everything in their power to maintain, provide and improve those facilities required to operate the port safely, which includes maintaining the safe navigation of vessels.

Byelaws and Directions are provided in order to manage navigation risk and should be backed by an appropriate policy on enforcement. This means that the Authority concerned should have a clear policy on prosecution, which is consistent with the safety assessment on which its directions are based.

It follows, therefore, that before making Byelaws or General Directions, consideration needs to be given to the methods and resources available for enforcing them. Un-enforced regulations may give a false sense of comfort about the management of risks, which they address.

The prime object of VTS is to provide vessels using a port with the necessary information, advice, or direction in order to achieve a safe passage from sea to berth and vice versa. In performing this function, those operating the system can also help maximise the efficient use of port facilities or constrained navigational channels, but this should be a secondary objective to that of ensuring safety. The over-riding duty of care must always be borne in mind, when assessing priorities.

Straits

Some ports lie within Straits, which have a high density of vessel traffic. Gibraltar, Singapore and Dover are three examples. Many collisions occurred in the Dover Straits until 1967 when the world's first internationally recognised Traffic Separation Scheme (TSS), sponsored by the International Maritime Consultative Organization (IMCO, now known as IMO) was introduced. However, compliance was purely on a voluntary, passive basis and collisions still occurred.

In 1972 the Channel Navigation Information Service (CNIS) was introduced in the Dover Straits. The operational centre is operated from the Maritime Rescue Co-ordination Centre (MRCC), high up on the cliffs of Dover at Langdon Battery and staffed by HM Coastguard.

A year later the French initiated a similar system at Cap Gris Nez, which is more or less opposite to Dover Harbour. The two Authorities enjoy good co-operation and between them maintain a twenty-four hour surveillance of the Straits. They also have mandatory powers enabling them to prosecute 'rogue' vessels, which contravene the International Regulations for Preventing Collisions at Sea.

The Turkish Straits, which includes the Strait of Istanbul (Bosphorus), the Sea of Marmara and the Strait of Çanakkale (Dardanelles), also constitutes as one of the world's major waterways between adjacent seas. At present, a modern VTS does not exist in this region and it has become common practice for ships to waits for hours drifting at entrance to the Straits increasing the risk of groundings and collisions, between the drifting ships and those entering or leaving the area. However, the Turkish Government is hoping to establish one in the very near future.

There are well over two hundred Straits throughout the world, some of which are strategically important militarily, as well as for international trade purposes. The concentration of shipping within these areas can be very dense, and the building of bridges, such as can be found between Sweden and Denmark, increases the risk of accidents.

Law of the Sea

The 1982 Law of the Sea (LOS) Convention stipulates, "*waters on the landward side of the baseline of the territorial sea form part of the internal waters of the State*". These consist of ports, roads, bays and inland seas. The traditional principle of freedom of access of international shipping to ports still causes concern in many circles.

Only thirty-five States have ratified the 1923 Geneva Convention, which does not include the United States of America or countries of the former Soviet Union. Thus, although the Convention stipulates the right of access to ports, it must be assumed that this is not universal except for the purposes of taking refuge.

Although the 1982 LOS Convention recognises freedom of access, this does not mean that ships are free to do as they please. The law of the sea grants coastal and port States wide powers of regulation to protect safety of navigation and prevent pollution. The keyword here is 'Regulation'. Thus, if a coastal or port State has ratified the Convention, strictly speaking, entry cannot be refused but it can be regulated.

The extensive powers granted to coastal and port States enables them to, "*decide which of its ports are open to international shipping, be able to close certain port installations temporarily, unless a ship is forced to take refuge and, regulate access conditions*".

Harbour Authorities need systems and people through whom to discharge their primary duty to ensure the safe and efficient use of the harbour by those who have a right to use its facilities and navigate its waters. This includes a duty to regulate navigation using available powers and other means. Since exercise of this function

depends upon communication with users, it is typically located where port communications from vessels are handled. The term 'port control' is thus applied to this function.

TYPES of VTS

There are four main types of VTS, namely;

1. Coastal
2. Estuarial
3. Harbour
4. Off-shore

Coastal type VTS is generally used for surveillance purposes, carried out in sensitive areas where some form of traffic management is required to ensure that vessels, passing through an area, comply with traffic separation schemes. For example, the English and French Traffic Surveillance authorities assist specific types of vessel transiting the Dover Straits, imparting information as and when required.

In the vicinity of a recently constructed bridge in the Great Belt, a VTS surveillance system has been set up to ensure the safe passage of traffic in that area. A similar system used to operate in the Flint Channel area, off Malmö Sweden, when another bridge was being constructed. In this latter area, the Swedish Maritime Administration at Malmö and the Danish Navy, at Drogden, ran the two VTS Centres. Since the completion of the bridge, the Swedish Authorities have decided to close their VTS Centre and it now only operates as a Harbour Control.

In 1979 a co-operative Vessel Traffic Service (CVTS) was established on the western coast of North America, to cover the Juan de Fuca coastal region. The United States and Canada jointly manage it, in a three-way agreement between, Tofino Traffic, Seattle Traffic and VTS Puget Sound.

Estuarial VTS can be found in particular areas, to ensure the safe transit of vessels in rivers or estuaries, on their way to a port, e.g. the River Thames for the Port of London, the Solent for Southampton and the approaches to the Port of Göteborg. Archipelago VTS may also be included in this type of VTS, because of the long transit between the outer approaches and the Port of Turku itself.

Port or Harbour VTS caters specifically for vessels entering or leaving a port with little or no pilotage run in, e.g. Dover or Portsmouth. There are some Harbour Authority areas, which overlap, for example the ports of London with Sheerness and Southampton with Portsmouth. Such overlaps can create local problems, where disparities arise in Operating Procedures, Regulations and Bye-laws.

Offshore VTS is used in areas where there is a proliferation of oil platforms. Off the River Humber, a particular oil company operates a group of oilrigs and requires a twenty-four hour surveillance to ward off any errant vessels. To facilitate this they have a master radar and communication station on one of the rigs. Support vessels

are also used to assist in the surveillance. The centre can also be used for Search and Rescue purposes.

Mandatory Reporting Schemes

The earliest ship reporting system was that devised by the USCG in 1958, called AMVER (**A**utomated **M**erchant **VE**ssel **R**eporting system - now renamed **A**utomated **M**utual-assistance **VE**ssel **R**escue system). The essence of the idea was that all vessels in the Atlantic Ocean area would report to the USCG, so that should any vessel be in distress the USCG would know what other vessels were in the vicinity. A similar system operates in the Pacific Ocean area.

There are now a number of areas throughout the world, where mandatory reporting is required; Dover Straits, Gibraltar Straits, Malacca Straits, to name but three. Australia has two reporting systems, namely; AUSREP and REEFREP. The latter system covers the Torres Strait and Great Barrier Reef, whilst the former system covers the western and southern approaches to the Continent as well as most of the Australian coastline.

A proposal for a new mandatory ship-reporting system follows the sinking of the tanker *ERIKA* off the west coast of France in December 1999 and should make possible a significant increase in safety, efficiency of navigation and environmental protection in and around the traffic separation system in operation off Les Casquets.

Under mandatory ship-reporting systems, ships are obliged to give information about themselves, including their identity and cargo, to Coastal Authorities. Authorities can then track voyages and communicate with ships immediately should a dangerous situation, such as risk of collision or grounding, arise. Outside mandatory reporting systems, Coastal Authorities may only be aware of blips on radar screens - with no further information on the target ships they are seeing.

The implementation of a mandatory ship-reporting system makes it easier to avert hazardous situations, which can be caused by unidentified ships adopting erratic or even dangerous routes, stopping in a traffic lane after sustaining damage, or otherwise behaving in such a manner as to give rise to confusion, in the absence of any information.

The new system, is to be called MANCHEREP and will apply to all ships of over 300 gross tons and will cover the current traffic separation system off Les Casquets and the areas bordering upon it. Ships over 300 gross tons entering the area would be required to give information to the Coastal Authorities, including name of ship, position, destination and details of cargo if any potentially dangerous cargoes are carried on board. Coastal Authorities would then be able to track the ships.

Eventually, similar reporting systems will operate on a global basis. This will become more popular once the universal Automatic Identification System (AIS) is established, which could even be used in conjunction with Inmarsat C.

IMO and VTS

On 27 November 1997, IMO adopted Resolution A.857(20) *Guidelines for Vessel Traffic Services*, together with Annex 1 *Guidelines and Criteria for VTS* and Annex 2 *Guidelines on Recruitment, Qualifications and Training of VTS Operators.* The

Guidelines are associated with SOLAS Chapter V, Regulation 12 and describe the principles and general operational provisions for the operation of a VTS and participating vessels.

The primary purpose of VTS is to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, worksites and offshore installations from possible adverse effects of maritime traffic.

The secondary purpose of VTS is to improve port operations by enhancing the safe passage of vessel traffic within the port or coastal area. This is facilitated by good communications and by comprehensive monitoring of the traffic image, by whatever means are available.

VTS RELATED ACRONYMS

Various Authorities and research bodies use several other acronyms and the following is a good cross-section of what they are:

Vessel Traffic Management (VTM)

Set of efforts (measures, provisions, services and related functions) which, within a given area and under specified circumstances, intend to minimize risks for safety and the environment, whilst maximizing the efficiency of waterborne transport

Vessel Traffic Management Service (VTMS)

Vessel Traffic Management System, applied for certain VTS, no internationally standardized term.

Vessel Traffic Information Service (VTIS)

Vessel Traffic Information System and used by some VTS Authorities instead of VTS – The Maritime and Port Authority (MPA) of Singapore currently classify their VTS as a VTIS.

Vessel Traffic Management Information Service(s) (VTMIS)

The concept of VTMIS evolved from the European R&D project COST 301 in the early nineties. This project looked into possibilities to improve VTS. One of the findings was that more could be done with the information available in the VTS.

Vessel Traffic Management is defined as the set of efforts (measures, provisions, services and related functions), which within a given area and under specified circumstances, intend to minimize risks for safety and the environment, whilst maximizing the efficiency of waterborne and connecting modes of transport.

Vessel Traffic Management and Information Services intend to respond to public and private demand for facilitating Vessel Traffic Management. Vessel Traffic Management and Information Services include services distributing in given areas (at regional, national or trans-national level) the pertinent information to be used both in real time and in retrieval modes.

The implementation of or participation in a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services, which are or will be implemented in the area, such as VTS, Allied Services and other information services, are interlinked and co-operate according to commonly harmonized procedures.

VTMIS is characterised by one or both of the following elements:

1. electronic exchange of information with services of the same kind in the neighbourhood, region or at distant locations ('horizontal information exchange')
2. electronic exchange of information with other maritime services - official or commercial, for example, allied or logistical services ('vertical information exchange').

Horizontal information exchange can be between VTS-areas and may contain information on vessel movements (in particular ETD at one port and the ETA at the next port), which will form the basis for a regional traffic image outside radar/VHF coverage. This can also be done without the involvement of VTS, for example, by using information from shipping agents and signalling services. It can become a real-time traffic image with the use of long range transponders.

Vertical information exchange within the VTS-area, may take the form of collective information exchanges concerning vessel movements, which take place without involvement of a VTS, for example, ETA notification to ports, pilots, tugs and terminals.

Whatever acronym is used, the three common letters are VTS. Shipmasters are really only concerned with the main heading, VTS and the types of service it provides. They fully expect information to be one of them and would expect the organisation to be well managed. The interchange of electronic information between the various allied services, is something that goes on behind the scenes.

VTMIS can generate quite a useful traffic image which the following bodies may utilise:

- Authorities (or their privatised service providers) involved in vessel traffic management, national maritime authorities, VTS authorities, Coastguard and emergency organisations
- Ports (and their independent service providers) involved in port resource management, pilotage organisations, tug companies, line handlers, information services and terminal operators
- Shipping companies (and their crews) involved in cargo flow and fleet management, including local shipping agents and shippers/forwarders

It is important to remember that VTMIS is a concept for all activities improving the exchange of information for the services relating to movements of vessels or the

cargo. The shortest possible description would be: "VTMIS are improving vessel traffic information".

THE VTS AUTHORITY

In operating VTS, the VTS Authority should ensure that the objectives of the VTS are met, that the standards set by the Competent Authority for levels of services and operators qualifications and equipment are met and that the VTS is operated in conformity with the relevant IMO Resolutions and SOLAS requirements.

Where appropriate, the VTS Authority should ensure that VTS operations are harmonised with ship reporting and routeing measures, aids to navigation, pilotage and port operations. A continuous listening watch on the designated radio frequencies should be kept and all published services must be available during the operational hours of the VTS. Operating procedures for routine and emergency situations must be established.

It is the responsibility of the VTS Authority to provide mariners in a timely manner with full details of the requirements to be met and the procedures to be followed in the VTS area. This information should include the following:

- The VTS Authority responsible for the operation of the service
- Categories of vessels required or expected to participate
- Areas of applicability
- The types and level of services available
- Radio frequencies to be used for reporting
- The times and geographical positions for submitting reports
- The format and content of the required reports
- Any information, advice or instructions to be provided to participating ships

All the above information should be published in the *World VTS Guide* and appropriate nautical publications.

FUNCTIONS of a VTS

"*The purpose of VTS is to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, worksites and offshore installations from possible adverse effects of maritime traffic*".

In order to discharge the VTS Authority's responsibility for the navigational safety of vessel traffic and to provide a VTS to all users, there are five main functions that need to be carried out:

- Management of vessel traffic through surveillance and monitoring
- Providing navigational safety and other related information to participants
- Scheduling vessel traffic within the VTS area

- Supporting other Authorities such as, Emergency and Search and Rescue
- Providing information to Allied Services

IMO Resolution A.857(20) *Guidelines for Vessel Traffic Services*, recognises "*Vessel Traffic Services (VTS)*" as the collective term and the three basic services that may be rendered by a VTS, namely:

1. Information
2. Navigational Assistance
3. Traffic Organisation

Information Service

This is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity and intentions of other traffic; waterway conditions; weather; hazards; or any other factors that may influence the vessel's transit.

Many small ports only provide an information service. That is to say, they receive information from and pass information to vessels, which are using the port concerned. Information may also be processed with respect to vessels passing close to the port, which may interfere with the vessel traffic entering or leaving.

The information processed may include the following content:

- Vessel identification, position, intentions, sailing plan, destination, type of vessel, draft and hazardous cargo on board
- Routine broadcasts concerning amendments and or changes in promulgated information on restricted or hazardous areas, navigational procedures, vhf radio channels, reporting points
- Factors influencing the navigation of vessels, meteorological and hydrological information, notices to mariners, status of other vessels, movement of vessels carrying hazardous cargo, deep draft vessels, traffic congestion or other conditions restricting the normal flow of vessel traffic

Fishing vessels and leisure craft, although generally not required to participate in the VTS, are particularly encouraged to monitor the VTS radio channels in order to monitor traffic movement information.

Navigational Assistance Service

This is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies. This service is normally provided at the request of a vessel or by the VTS when deemed necessary.

The term '*navigational assistance*' has caused difficulty with a number of authorities with respect to its interpretation. First of all it is primarily advice to assist those on

board with the navigation process and not just information, which may concern the light on a navigational mark, for example.

Authorities are often worried about the implications of liability when providing such assistance. Should a vessel find itself in inclement weather or develop a serious equipment problem on board, for example, that vessel may well require assistance from the VTS, even if it is only in the form of directions to a safe anchorage. The VTS has a duty of care to ensure the safe passage of traffic within its area. If a vessel genuinely requires navigational assistance, the VTS should do everything in its power to co-operate.

Generally speaking, navigational assistance is only given on request by a vessel, providing it meets certain navigational equipment criteria or if the VTS considers it necessary for reasons of navigational safety. When communicating with vessels, the Port of London uses the expression '*assisted passage*'.

One classic example where navigational assistance would be required is, if the Pilot on board suddenly collapsed and the Master, who may be foreign to the waters that the vessel is transiting, does not know where the vessel is.

Section 2.3.4 of IMO Resolution A.857(20) states; "*When the VTS is authorised to issue instructions to vessels, these instructions should be result orientated only, leaving the details of execution, such as course steered or engine manoeuvres to be executed, to the master or pilot on board the vessel. Care should be taken that VTS operations do not encroach upon the master's responsibility for safe navigation, or disturb the traditional relationship between master and pilot.*"

The nature and sophistication of equipment being used, tends to encourage VTS personnel to become involved in the navigation of ships. This is not necessarily a good thing and the personnel concerned must endeavour not to get involved in collision avoidance or ship handling manoeuvres, which is a shipboard function.

In the ordinary course of their work however, the personnel are providing a service, on behalf of their employer, the VTS Authority and it is upon this service, that those who have the conduct of their vessels, are increasingly coming to rely.

All decisions concerning a vessel's operation must be ship-based, if only for reasons of liability. This means that the command and responsibility for safe navigation of a vessel lies with the vessel, whilst the control and regulation of traffic, lies with the VTS authority. However, that control may normally be limited to requiring certain general courses of action to be adopted or avoided.

Navigational assistance information may include the following content:

- Position relative to the fairway, a navigational mark, a reporting point or waypoint
- Actual course being made good (ground track direction and speed) of the vessel concerned
- Course to make good to a new waypoint

- Positions, identity and intentions of traffic in the immediate area

In order to achieve the objectives of providing navigational assistance, good radio communications are necessary, as is the ship being fitted with adequate navigational equipment and staffed with competent personnel.

Traffic Organisation Service

This service concerns the operational management of traffic and the forward planning of vessel movements to prevent congestion and dangerous situations and is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic.

Traffic Management was not invented by mariners. It has long been practiced on roads and highways, railroads and in the air. In no other mode is the separation of traffic not an integral part of the overall management scheme. Traffic separation, in either space or time, is fundamental to most VTS.

The term 'Traffic Management' generally encompasses all three services with its primary purpose being to ensure the safe and efficient transit of vessel traffic in a VTS area in an effort to prevent collisions, groundings and associated loss of life or injury and damage to property as well as maintain the protection of the environment. However, as has already been said, it may well be that the VTS operation itself is not very big and may only interest itself in reception and transmission of information.

Traffic Organisation Service may also include establishing and operating a system of traffic clearances or VTS sailing plans or both in relation to priority of movements, allocation of space, mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS Authority.

Traffic Management is accomplished by coordinating vessel movements through the collection, verification, organisation, and dissemination of information. To accomplish this, the VTS uses the following levels of control:

- Identification
- Monitoring
- Information
- Advice / Recommendation
- Direction

Identification

Positive identification is one of the main keys to good communication and the monitoring of vessel traffic. Whether the vessels are arriving, departing or transiting a VTS area, positive identification is a MUST.

Tracking technology is such that it is not perfect and vectors often lose tracking stability in areas of poor radar coverage or when vessels pass close to each other. If the Operator is not vigilant, communications may be carried out with the wrong vessel, simply because the swapping of a target vector with another vessel has gone unnoticed.

Monitoring

To facilitate the monitoring of vessel traffic in an area, a number of different methods may be used, such as:

- Visual observation
- VHF surveillance
- Radar surveillance
- VTS assisted automatic tracking
- Closed Circuit Television (CCTV)
- Universal Automatic Identification System (UAIS)

The VTS should endeavour to use all the existing facilities available, including communications equipment.

The VTS may also receive information from various sources concerning predicted vessel movements, hazards to navigation, aids to navigation and other information of interest to VTS users.

Monitoring vessel traffic ensures that vessels are being navigated safely and efficiently in accordance with local and regional regulations as well as the applicable rules of navigation, such as the International Regulations for Preventing Collisions at Sea. It should also ensure that developing dangerous situations are avoided in good time.

Information

Information gathered is analysed, the result of which is passed on to those participating in the VTS. This is done at the user's request, when it appears necessary to the VTS personnel, or at regular intervals in timed VHF radio broadcasts. The purpose of informing those participating in the VTS is to give them timely information to allow them to make decisions in good time concerning the navigation of their vessels.

Advice / Recommendation

Most VTS operations are conducted at the monitor and inform levels. However, at certain times the VTS will recommend action be taken by a participant to prevent a potentially dangerous situation.

Such recommendations are offered to assist the participant in taking early action to avoid hazardous situations. Recommendations are made on the premise that there is information available to the VTS, of which the participant may not be aware.

Direction

On very rare occasions the VTS will direct the movement or actions of a participant. A *'special'* Direction would be given in cases when the VTS observes obvious violations of regulations or an obvious and immediately dangerous situation developing, which the participant is not, or does not seem to be, aware. Directions may also be given in the event of a response to an emergency, where vessels may need to be diverted to another berth, anchorage or even sent back to sea.

The ultimate responsibility for safe navigation of a vessel always remains with the Master. When performing its operational functions, the VTS is not relieving the Master of the responsibility to control the vessel movement.

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Sailing Plan

A Sailing Plan is a plan, which is mutually agreed between a VTS Authority and the Master of a vessel concerning the movement of the vessel in a VTS area. Prior to departure from a berth or on arrival at a VTS regulated area, a vessel should provide a sailing plan to the VTS together with intentions, which will include, any contingency arrangements to cover for possible emergency scenarios en-route. The Sailing Plan should contain the following information:

- Pilot
- Vessel name
- Type of vessel
- Hazardous cargo, if any
- Number of passengers, if any
- Present position
- Destination
- Route
- Draft

Position Reports

Once en-route, vessels should provide position reports as follow:

- When the vessel is actually underway or upon entry into a VTS area
- When passing a reporting point, or at times as instructed by the VTS
- After pilot change or departure of pilot
- When any deviation is made to the Sailing Plan
- When observing navigational hazards
- Changes observed to any Aids to Navigation

- Severe meteorological/hydrological changes
- When an emergency situation arises either on board or in the vessel's vicinity

Final Report

A final report should be made:

- Upon arrival at the berth,
- Upon anchoring
- On departing the VTS Area

Incident Report

A report should be made:

- When an incident occurs involving the loss or likely loss overboard of packaged dangerous goods, including those in freight containers, portable tanks, road and rail vehicles and ship borne barges, into the sea.
- When an incident occurs involving the discharge or probable discharge of oil (Annex I of MARPOL 73/78) or noxious liquid substances in bulk (Annex II of MARPOL 73/78).
- Marine pollutants report (MP) - In the case of loss or likely loss overboard of harmful substances in packaged form, including those in freight containers, portable tanks, road and rail vehicles and ship borne barges, identified in the International Maritime Dangerous Goods Code as marine pollutants (Annex III of MARPOL 73/78).

Anchorages

Navigational charts generally show the boundaries of designated anchorage areas, such information being complemented by information from the VTS which may include certain restrictions imposed on anchoring, requiring various reports from vessels anchoring both in and outside of the designated anchorages.

VTS traffic management of the anchorages includes ensuring proper separation of anchored vessels to prevent their swinging or dragging into each other. A mandatory separation may be imposed and should a vessel be seen to be in violation of the separation distance, the vessel concerned should be directed by the VTS to re-anchor at a greater distance. The vessel, which was the last to arrive is normally the one required to move. Vessels should maintain a continuous watch with the VTS on the required VHF radio channels.

A vessel anchoring outside an established anchorage area for reason of imminent peril or heavy fog should be positioned outside the vessel traffic lanes or ship channel insofar as practicable. If it is necessary to anchor within a traffic lane or channel, the vessel should be positioned as near the edge of the lane or channel as practicable. Vessels anchoring outside of established anchorages should notify the VTS as soon as possible.

Vessels anchoring in any anchorage are required to reserve the deeper portions of the anchorage for vessels of deeper draft. Shallow-draft vessels may be required to move if the area in which they are anchored is needed by a vessel of deeper draft.

Normally all vessels entering and transiting a VTS area, are encouraged to participate and co-operate with the requirements of the particular VTS Authority. Some VTS areas have designated routes especially for recreational craft and fishing vessels. Whilst it is accepted that there may be some non-participating vessels in the VTS area, they too should be encouraged to monitor the relevant communication channels and provide information as and when required.

VTS and PILOTAGE AUTHORITIES

The UK Pilotage Act 1987, defines a pilot as having the same meaning as in Section 742 of the Merchant Shipping Act 1894, viz. "*any person not belonging to a ship who has the conduct thereof.*" This particular phrase has often been misinterpreted as meaning, that the pilot may be remote from the ship and still have the conduct of it. Whereas, in fact, it really means that although pilots are not part of the permanent crew, they are actually on board said vessel.

An eminent 18th century authority on UK maritime law wrote; "*The name of a pilot or steersman, is applied either to a particular officer, serving on board a ship during the course of a voyage and having the charge of the helm and the ships' route, or to a person taken on board at a particular place for the purpose of conducting a ship through a river, road, or channel, or from or into a port.*"

In spite of Charters and Policies being adopted by the various Pilotage Organisations, the infrastructure in some Ports, with respect to direct Pilot involvement, is quite different. The VTS may be operated entirely by the Pilots (Sullom Voe), whilst in others the Pilots are either in a Supervisory role (London), or present only in fog conditions (Bremerhaven) or have no involvement whatsoever (Helsinki).

One disadvantage with Pilots performing VTS duties on a part time basis, is that they lose valuable pilotage time and experience and, albeit on a temporary basis, their Pilotage skills may suffer. Very often, Pilots are only active in the VTS Centre for a relatively short period, maybe six months. This means that their skill level in VTS work likewise suffers and they need to place great reliance on the more permanent personnel, working with them.

IMO Resolution A.857(20), clearly confirms that the command of the ship, lies with the ship itself and not with the shore. Pilots have an important role to play within the framework of VTS both as user and provider of information. However, a pilot employed in an operational VTS centre and communicating with a vessel, does not have command or control of the particular vessel as such and is therefore only providing the services for which the VTS is intended.

'*Shore Based Pilotage*' and '*Remote Pilotage*' are misnomers and one should be cautious when attempting to classify such expressions as an act of pilotage. However one wishes to interpret these phrases, it is and, can only be, '*Navigational*

Assistance'. Such assistance should only be provided by an appropriately qualified person.

In Germany the Pilots agree that Pilotage is a natural part of any Traffic Management System in restricted waters. In that Country, shore-based radar assistance by pilots in special circumstances is already an integral part of the services offered. By national and international agreement, shore-based radar assistance is the sole task of pilots, who have special knowledge both of the river and of shipping and have special training and experience in this particular service.

VTS OPERATING PROCEDURES

VTS Operating Procedures are categorised as either Internal or External and then further subdivided as Routine or Emergency. The Procedures that follow are purely a generic guide. The Authorities themselves will need to be guided by the environment and constraints of their own Ports.

All VTS operating procedures should be laid down in handbooks or manuals and be an integral part of regular training exercises. Adherence to such procedures should be monitored. Procedures for the enforcement of VTS routes should also be developed.

External Routine Procedures

These govern the interactions with users and allied services.

Vessels Arriving at the VTS Area

- Collect advance information in accordance with local rules and regulations
- Identifying and establishing communications with approaching vessels

Vessels Entering VTS Area

- Confirm required advance information has been obtained
- Initiate further information acquisition if necessary

Vessels Transiting VTS Area

- Monitor the movements of participating vessels
- Monitor the movements of non-participating vessels if considered significant to the movement of participating vessels

Provide relevant information to participating vessels:

- environmental conditions
- traffic
- navigational etc.

- issue warnings and restrictions concerning the movement of traffic in the area

Vessels at Anchor

- If surveillance is available monitor their position
- Maintain communications with the vessels
- Obtain reports from vessels prior to them leaving the anchorage

Vessels at Berth

- Communication with VTS is generally unnecessary but conditions may require them to be maintained constantly
- Their presence may need to be declared to other vessels transiting the area
- Obtain reports from vessels prior to them leaving the berth

Vessels Departing the VTS Area

- Reports should be requested from vessels prior to and when departing the area

Transition Between Adjacent VTS Areas

- To ensure that the handover of, vessel identification, vessel information, communication procedures and monitoring responsibility are concluded satisfactorily

Unexpected Events or Emergencies

- Procedures should be developed for unexpected events or emergencies

Internal Routine Procedures

Address operating instruments, interactions among the staff and the internal routeing and distribution of data.

These should be established by the VTS Authority to include the following:

- Recording and retaining communication, surveillance and other data
- Ensuring that the staffing of operational positions is secured
- Equipment operation and maintenance
- Interactions with Allied Services (contingency plans)
- Media relations
- Security

External Emergency

VTS Authorities should ensure that procedures are established in order to respond to external emergencies such as:

- Vessel Not Under Command (NUC)
- Collisions (including those with fixed objects)
- Groundings
- Blockage of the fairway (temporary)
- Pollution
- Medical
- Fire
- Protest actions (including riots)
- Terrorist actions
- Ship rage (problems with unruly passengers/crew)
- Search and Rescue / MOB
- Natural disasters
- Piracy
- Ship stability problems
- Handling media

Procedures should also be established for re-commencing routine operations when the emergency has been addressed.

Internal Emergency

VTS procedures should be developed by the VTS Authority in order to respond to internal emergency procedures such as:

- Loss of functionality, of communication equipment due to
  - Power failure
  - Component failure, etc.
- Loss of functionality of surveillance equipment due to
  - Power failure
  - Component failure, etc.
- Loss of functionality of data processing and data handling equipment due to
  - Power failure
  - Component failure etc.
- The activation of redundancy systems.
- Internal emergencies due to:

- Fire
- Flood, etc.

- Forced evacuation of VTS centre
- Personnel medical emergencies
- Loss of landline communications
- Access to information
- If necessary, informing participating vessels and/or Allied Services of changes in level of services.

VTS Authorities should ensure that procedures are established to implement:

- Activation of alternative accommodation and/or systems
- Mobilisation of additional staff
- Emergency repairs

COMMUNICATIONS

This topic is perhaps one of the most important with respect to port operations and safety of navigation.

"*The efficiency of a VTS will depend on the reliability and continuity of communications and on the ability to provide good and unambiguous information*".

Communication between ship/shore and shore/shore are an essential component to a successful port operation. Each item of radio traffic handled by the VTSO demands interpretation and action.

Current practice is for vessels to be identified by voice communication when they enter the VTS Area, which is defined by the limits of the radar and VHF communication systems. In a busy port this can result in a high volume of VHF based communication with the need to utilise direction finding equipment to enable the origin of the VHF broadcast to be triangulated onto a radar derived target within the VTS system.

The vessel identity is then manually entered into the VTS system so that it is attached to the appropriate radar track. In such a high volume environment, it is easy for human error to occur, and voice communication channels can become congested which also slows down the identification process.

Equipment considerations that can facilitate efficient radio traffic include good quality transceivers, good radio coverage (i.e. with a minimum of or no '*blind spots*'), use of good quality speakers and headsets in the VTS Centre and acceptable background noise levels in the VTS Centre.

Radio workload can also be eased by the use of alternative means of exchanging information between the ship and shore, such as GMDSS and AIS. Text based

systems often require less operator attention and can ease communications difficulties caused by differing standards in spoken English. Some VTS Centres are adopting the use of text messages over the cellular telephone network, particularly to Pilots. This practice should not supersede voice communication, which allows positive acknowledgement of important messages.

An important distinction arises between the collecting and giving of information and advice (which is a two-way flow between those using the port and those managing it) and the giving of directions by or in the name of the Harbour Master. Communications need to identify whether they are information, advice or directions. It is important that the power to give directions is properly controlled by the delegation procedures adopted by the Authority. Communications to vessels should be in a specific language that makes clear whether it is advice or a direction that is being given.

Communication Format

Where language difficulties may exist, the languages used should include English, using where possible the Standard Marine Communication Phrases (SMCP). Alternatively, the International Code of Signals may be used to send detailed information. When the International Code is used, the appropriate indicator should be inserted in the text, after the alphabetical index.

Communication between a VTS Authority and a participating vessel should be conducted in accordance with the IMO Resolution A.851(20) "*General Principles for Ship Reporting Systems and Ship Reporting Requirements, Including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants*" and should be limited to information essential to achieve the objectives of VTS.

The method of communicating can take several forms:

- Landline telephone
- VHF radio
- Verbal
- Fixed light signals
- Computer data link
- Signalling lamp
- Lights and shapes shown from the port signal station

Any form of communicating must be in a format, which is clear, concise and procedurally correct. Communicating in the speech format is a skill in itself. When communicating with another person whose mother tongue is different, the speaker will need a fourth discipline and that is to speak slowly. When talking to another person whose mother tongue language is the same, people invariably talk much quicker without realising they are doing so.

Message Markers

Talking on the radio in particular requires considerable self-discipline and the use of Message Markers is recommended. Careful choice of words is required and to this end, IMO adopted the Standard Marine Navigational Vocabulary (SMNV).

To assist in the greater safety of navigation and to standardise the use of English as a safety language, IMO will be adopting new Standard Marine Communication Phrases (SMCP).

Message Markers are words, which prefix a sentence or statement, the idea being to make it quite clear to the recipient what is intended.

The following are the recommended Message Markers:

- Information
- Advice
- Instruction
- Warning
- Question
- Answer

In-Port

In-port communication links are needed in addition to that provided for communication with vessels. These can typically include:

- VHF radio communications with Allied Services
- Low power UHF radio for use in berthing/docking operations.
- High power UHF for transmission of transmission of data, such as GPS digital corrections for precision surveying, etc.
- Computer networks and mobile telephones
- Fixed data links (analogue and digital) for transmission of remote sensor information.
- Fibre optic land lines for transmission of broad band sensor and other data

Allied Services are those actively engaged in the safe and efficient passage of vessel traffic through in a VTS area and may take the form of:

- Pilots and Pilot Boats
- Tugs
- Agents
- Customs and Excise
- Immigration

- Health
- Stevedores
- Emergency Services
- Coastguard
- Meteorological / Hydrological Departments

Dangers in the Use of VHF Radio

Communication between a VTS Authority and participating vessel traffic, particularly in areas of high traffic density, should be limited to information essential to achieve the objectives of the VTS and, unless there is an emergency involving safety of life at sea or a threat to the marine environment, the information should not be used for any other purpose.

There have been a significant number of cases when it has been found that at some stage before a collision, one or both parties were using VHF radio in an attempt to avoid collision. The use of VHF radio in this role is not always helpful and may even prove dangerous. If VHF '*assisted collisions*' are to be avoided, careful guidance and training needs to be given to VTS personnel.

Uncertainties can arise over the identification of vessels and the interpretation of messages received. Even where positive identification has been achieved, there is still the possibility of a misunderstanding between the parties concerned due to language difficulties, however fluent they are in the language being used. An imprecise or ambiguously expressed message could have serious consequences.

OPERATION of AIS in a VTS AREA

AIS has been designed to assist vessels operating in a Vessel Traffic Service (VTS) area or TSS at the same time ensuring the ability of the VTS to identify vessels and communicate via the VTS with regard to information of assistance to a vessel in the VTS area or the VTS itself.

In addition the information from the AIS in a VTS area will assist identification of the vessel's target, on the radar, Electronic Chart Display Information System (ECDIS) or other Electronic Chart Systems (ECS) and enable the VTSO to better monitor and manage the traffic in the particular area of the VTS. Depending on the VTS type, it will use the AIS to provide related information, assistance or transmit an instruction to a particular vessel, in the VTS area.

It is the duty of a vessel operating in a VTS area to familiarise itself with the type of VTS, its mode of operation and all relative information such as traffic separation schemes, designated anchorages and pilot transfer areas. In addition the AIS display should be continuously monitored to ensure that any safety or voyage related message and/or information, is either transmitted by the vessel whilst in the area or, when received from the VTS, is appropriately acted upon.

AIS is unlikely to render either radar or voice communications obsolete but rather confirm them. Initially at least, non-SOLAS vessels are unlikely to be fitted with AIS. It can also be expected that many older SOLAS vessels will delay fitting the equipment. Radar will remain, therefore, the primary detection and tracking system capable of handling all targets. It will also provide a tool to monitor the correct position of floating aids to navigation as well as being an important check of electronic position fixing integrity.

A further argument for retaining VTS radar is the ability of VTS to provide information on tracked radar targets, to be broadcast as AIS targets. The retention of radar within a VTS, after the implementation of AIS, will depend upon the operational characteristics of that VTS area and, in particular, the density of non-AIS fitted vessels operating in the area.

The use of AIS increases efficiency by reducing the need for voice communications and for VTS operator manual input functions. Voice communication will remain an essential and most important method for passing VTS information to and receiving information from vessels not fitted with AIS. It will also be required in emergency situations and other cases where immediate confirmation or an acknowledgement is required, such as when providing navigational assistance.

AIS and Pilotage

In very busy areas, like ports, harbours, rivers and archipelagos, the need for a high update rate to be provided by AIS is evident. The limitations of the Automatic Radar Plotting Aid (ARPA) radar to track ships due to target swapping from a ship to land, beacons, bridges and other ships makes the ARPA capabilities very limited in narrow and congested waters.

Today there is a strong feeling among mariners navigating in ports, harbours, rivers and archipelagos, that a broadcast AIS would improve navigational safety and at the same time solve some of the problems with targets observed on radar or targets which are known to be in the area but unseen by radar. This would be achieved for example by, providing target information beyond the bend in a channel or behind an island in an archipelago, thus detecting the presence of other vessels and identifying them. Predicting the exact position of a meeting with another vessel(s) in a river or in the archipelago would allow for the correct collision avoidance manoeuvre to be made and detect a change in a vessel's heading almost in real time.

Many papers have been written on the subject of Shore-Based Pilotage (SBP) and how AIS will assist. Some organizations have even included SBP in their modus operandi. Both the International Marine Pilots Association (IMPA) and EMPA (European) define SBP as, "an act of pilotage carried out in a designated area by a pilot licensed for that area from a position other than on board the vessel concerned to conduct the safe navigation of that vessel".

This definition is quite contrary to the International Maritime Organization (IMO) Resolution A.857(20) Guidelines for Vessel Traffic Services, Annex 1, Section 2.3.4

which states that; "When the VTS is authorised to issue instructions to vessels, these instructions should be result orientated only, leaving the details of execution, such as course steered or engine manoeuvres to be executed, to the master or pilot on board the vessel. Care should be taken that VTS operations do not encroach upon the master's responsibility for safe navigation, or disturb the traditional relationship between master and pilot."

IMO Resolution A.857(20) clearly confirms that the command of the ship lies with the ship itself and not with the shore. Pilots have an important role to play within the framework of VTS both as user and provider of information. However, a pilot employed in an operational VTS centre and communicating with a vessel, does not have command of the particular vessel as such and is therefore only providing the services for which the VTS is intended. '*Shore Based Pilotage*' and '*Remote Pilotage*' are misnomers and one should be cautious when attempting to classify such expressions as an act of pilotage.

All decisions concerning a vessel's operation must be ship-based, if only for reasons of liability. This means that the command and responsibility for safe navigation of a vessel lies with the vessel, whilst the control and regulation of traffic, lies with the VTS authority. However, that control may normally be limited to requiring certain general courses of action to be adopted or avoided.

The UK Pilotage Act 1987, defines a pilot as having the same meaning as in Section 742 of the Merchant Shipping Act 1894, viz. "any person not belonging to a ship who has the conduct thereof." This particular phrase has often been misinterpreted as meaning, that the pilot may be remote from the ship and still have the conduct of it. Whereas, in fact, it really means that although pilots are not part of the permanent crew, they are actually on board said vessel. This has been borne out by court rulings made as a result of casualties occurring due to pilots attempting to direct a vessel without being actually on board.

Impact of AIS on VTS

As soon as a VTS centre is equipped with the facility to utilise AIS, it will have an immediate impact. Probably the greatest advantage will be the immediate identification of AIS equipped vessels. AIS will also enhance the service provided by the VTS centre including navigational assistance.

Some VTS centres may have to update their display equipment in order to facilitate the reception of AIS data. Computer processors may have to be upgraded in order to cope with the increase of received data and a filtering system may need to be introduced in order to block data being sent by vessels not directly involved in a particular VTS centre's traffic operations, otherwise displays will become saturated. When used together there will have to be extremely good correlation between the radar signal of a target and the AIS signal. There will also be several vessels not fitted with AIS who will need to be treated in the conventional manner.

CASE STUDIES

Major maritime disasters have occurred throughout history and are still occurring with unfortunate regularity. Some of these disasters are causing ports and localities to suffer, not only severe pollution within their immediate environment, but also loss of life to personnel and wildlife. The knock-on effect is quite substantial and may even enforce the closure, albeit temporary, of the port itself. Of course, no amount of training can account for the human factor but it can go a long way in reducing the risk involved. One aspect of VTS training is crisis management. Most ports have procedures to follow in case of an emergency and exercises should be carried out on a regular basis. The following casualties all occurred within VTS areas:

Case 1

A collision between two tankers, under the Golden Gate Bridge in San Francisco, during heavy fog in the early morning of 18 January 1971, nearly caused a major catastrophe. Ironically, the introduction of the Harbour Advisory Radar (HAR) in San Francisco and elsewhere, had met with considerable opposition from pilots and masters. It was seen as an attempt to impose guidance and advice by unqualified Coast Guard Officers on the navigation of vessels. Resentment may explain why the Master of OREGON STANDARD, one of the two tankers involved, ignored the services of the HAR after leaving the berth. However, it does not excuse his failure to obtain information about the other vessel, ARIZONA STANDARD, within the Bay area, relevant to the navigation of his own vessel. This case clearly demonstrated the value of VHF communication as a valuable means for averting such a casualty.

Case 2

A catastrophic collision between two Ro-Ro ferries, EUROPEAN GATEWAY and SPEEDLINK VANGUARD, occurred in the approaches to the Port of Harwich, on the night of 19 December 1982. The EUROPEAN GATEWAY was outward bound and the SPEEDLINK VANGUARD was inbound. Both vessels were reporting to Harwich Harbour at the respective reporting points. However, the final message to Harwich Harbour, passed by the outbound ship, also included that vessel's navigational intent. The Master of the inbound vessel did not hear this message, neither was it reported to him. Subsequent confusion arose on the inbound ship, as to what the outbound vessel was doing and shortly afterwards the SPEEDLINK VANGUARD collided with the EUROPEAN GATEWAY, the latter vessel eventually capsizing due to severe flooding.
It was the belief of the UK Department of Transport that, "this collision occurred because of a degree of over complacency on the bridge of both vessels in the performance of what may have appeared routine and unexacting navigation." It would appear that neither vessel communicated directly with the other, nor did Harwich Harbour inform the vessels of any navigational intent received. Although the bridge personnel would endeavour to assimilate all VHF information, as best as they were able to, the common law duty of care really only extends to listening for signals addressed to the receiving vessel or all ships. "It may also extend to listening to all VHF traffic in special circumstances where it is foreseeable that general VHF traffic will be likely to have implications on the safety of the listening vessel."

Case 3

The Chinese bulk carrier TUO HAI was in collision with the Japanese factory fishing vessel TENYO MARU, in international waters off British Colombia, on the morning of

22 July 1991. The collision resulted in the sinking of TENYO MARU with the loss of one life.

The Transportation Safety Board (TSB) of Canada determined that the vessels collided because neither was using appropriate collision avoidance procedures in conditions of dense fog and because the crew members of TUO HAI were unable to understand important communications in English. The fact that the TENYO MARU had not been warned by the Marine Traffic Regulator, was a contributing factor.

Following this occurrence, Transport Canada modified its operational procedures to help identify vessels within the VTS radar surveillance zones in question, by adding requirements to the Canada/United States Co-operative VTS (CVTS) agreement. The agreement now requires all communications with Tofino, Seattle or Vancouver Traffic be made in English. At least one person capable of conducting two-way radio communications in clear and unbroken English must be present on the bridge at all times within the CVTS area.

The TSB believed that in congested areas, radar transponders installed on board vessels could allow positive identification by the Marine Traffic Regulator and thereby facilitate timely warning of nearby traffic. On this basis, the Board recommended that the Department of Transport examine means for promoting the carriage and Operation of transponders on large vessels sailing in congested Canadian waters.

Case 4

The WESTERN WINNER was in collision with BRITISH TRENT, in the vicinity of the Wandelaar pilot station, off the Belgium coast on the morning of 3 June 1993, which resulted in fire and the loss of nine lives.

(The quotes are taken from the MAIB Report):
(6.4) - Vessel Traffic Service
A pamphlet issued by VTS-SM (Vessel Traffic Service - Scheldt Mondingen) states; "*The main task of the VTS-SM is to provide information to shipping and, if necessary, traffic organisation could be implemented.*"

"*The failure to report to VTS-SM resulted in WESTERN WINNER not being identified on the VTS radar until the Master made a call to the pilot, less than three minutes before the collision.*"

(7.5) - Radar control and monitoring of the situation by VTS

"*Radar control knew the position, course and speed of BRITISH TRENT and that there was reduced visibility in the pilotage area. They were also aware that an unknown vessel was proceeding on an easterly course towards the pilotage area at a relatively high speed. Unfortunately the potential hazard of this situation was not recognised and no warning information was passed to BRITISH TRENT or to her pilot.*"

(11.4) - Control at the scene of the accident

"*When incidents such as this occur it would be prudent to introduce immediately, the procedures which apply when pilotage is suspended. This would give remote pilotage advice to vessels through the VTS-SM system so that they could be kept clear of both the casualty and one another. The VTS-SM system has the ability to readily identify and communicate with all vessels in the area.*"

The remote pilotage advice is purely ADVICE and not pilotage as such.

(12.5) - Findings

"*He (the Master of WESTERN WINNER) did not participate in the Vessel Traffic Service system which meant his vessel was not identified on the Traffic Service radar.*"

(12.6) "*(VTS-SM) did not monitor the traffic situation and did not give information about the developing dangerous situation when an unidentified relatively fast moving vessel entered a manoeuvring area in restricted visibility.*"

(13.2) – Recommendations

"*The Bermuda Registry of Shipping should liaise with the Belgian and Netherlands Authorities responsible for the operation of the Vessel Traffic Service, in order to make it more effective in traffic control.*"

Should the duty of care of those on duty at (VTS-SM), have extended to voluntarily communicating with *WESTERN WINNER*, without that vessel officially participating in the VTS system, even though they apparently knew about the existence of an unidentified vessel in the area? It would appear that had the *WESTERN WINNER* participated in the VTS system, VTS-SM may well have communicated with her and advised on the developing situation.

Case 5

The *SEA EMPRESS* grounded in the approaches to Milford Haven in the evening of 15 February 1996. A pilot was on board and the vessel was entering the Haven via the West Channel. (the following quotes are taken from the MAIB Report):

(7.4) "*As there was no agreed track it would have been impossible for a watch officer monitoring the radar to warn the pilot since he would not know what the pilot's intended track was. As the vessel closed with the Channel entrance, a set by the tide towards one side or the other would probably not have been apparent on radar unless the bearing and range discrimination was unusually good. In any case it is unlikely that warning given at such a late stage in the approach to the entrance, probably less than half a mile from it, would be timely enough to avoid a grounding in the entrance. It is considered that the existing radar installation, had it been operational and manned, would not have prevented this grounding.*"

(21.16) "*Although considered to be an important part of best 'practice' in safe operations the fact that the port radar installation was not operational did not contribute to the initial grounding.*"

Although the report states that the non-operational aspect of the port radar installation, did not contribute to the initial grounding, had it been working properly however, the

personnel concerned may well have been in a position to communicate with the vessel in good time and prior to the pilot boarding.

Summary

Whilst all the above casualties occurred in areas where VTS was present, it is not inferred that the VTS authorities concerned, contributed to them. In each case, communications or the lack of, was an important aspect. Interestingly enough, a considerable number of aircraft accidents are caused by improper use of, or simply a lack of, communications.

APPENDIX 1

RESOLUTION A.857(20)

Adopted on 27 November 1997

GUIDELINES FOR VESSEL TRAFFIC SERVICES

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO resolution A.158(ES.IV) entitled "Recommendation on Port Advisory Services", resolution A.851(20) entitled "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants" and resolution MSC.43(64) entitled "Guidelines and Criteria for Ship Reporting Systems",

BEARING IN MIND the responsibility of Governments for the safety of navigation and protection of the marine environment in areas under their jurisdiction,

BEING AWARE that vessel traffic services have been provided in various areas and have made a valuable contribution to safety of navigation, improved efficiency of traffic flow and the protection of the marine environment,

BEING ALSO AWARE that a number of Governments and international organizations have requested guidance on vessel traffic services,

RECOGNIZING that the level of safety and efficiency in the movement of maritime traffic within an area covered by a vessel traffic service is dependent upon close co-operation between those operating the vessel traffic service and participating vessels,

RECOGNIZING ALSO that the use of differing vessel traffic service procedures may cause confusion to masters of vessels moving from one vessel traffic service area to another,

RECOGNIZING FURTHER that the safety and efficiency of maritime traffic and the protection of the marine environment would be improved if vessel traffic services were established and operated in accordance with internationally approved guidelines,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its sixty-seventh session,

1. ADOPTS the Guidelines for Vessel Traffic Services and the Guidelines on Recruitment, Qualifications and Training of VTS Operators set out in annexes 1 and 2 to the present resolution;

2. INVITES Governments to take account of the annexed Guidelines when developing, implementing and operating vessel traffic services;

3. RECOMMENDS Governments to encourage masters of ships navigating in areas for which vessel traffic services are provided to make use of such services;

4. REVOKES resolution A.578(14).

ANNEX 1

GUIDELINES AND CRITERIA FOR VTS

PREAMBLE

1 These Guidelines are associated with SOLAS regulation V/8-2 and describe the principles and general operational provisions for the operation of a vessel traffic service (VTS) and participating vessels.

2 Contracting Governments should take account of these Guidelines when planning, implementing and operating vessel traffic services.

3 These Guidelines should be used in conjunction with the applicable Guidelines and Criteria for Ship Reporting Systems, resolution MSC.43(64) and the IALA VTS Manual.

1 DEFINITIONS AND CLARIFICATIONS

1.1 The following terms are used in connection with vessel traffic services:

1.1.1 Vessel traffic service (VTS) - a service implemented by a competent authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

1.1.2 Competent authority - the authority made responsible, in whole or in part, by the Government for safety, including environmental safety, and efficiency of vessel traffic and the protection of the environment.

1.1.3 VTS authority - the authority with responsibility for the management, operation and co-ordination of the VTS, interaction with participating vessels and the safe and effective provision of the service.

1.1.4 VTS area - the delineated, formally declared service area of the VTS. A VTS area may be subdivided in sub-areas or sectors.

1.1.5 VTS centre - the centre from which the VTS is operated. Each sub-area of the VTS may have its own sub-centre.

1.1.6 VTS operator - an appropriately qualified person performing one or more tasks contributing to the services of the VTS.

1.1.7 VTS sailing plan - a plan which is mutually agreed between a VTS Authority and the master of a vessel concerning the movement of the vessel in a VTS area.

1.1.8 VTS traffic image - the surface picture of vessels and their movements in a VTS area.

1.1.9 VTS services - VTS should comprise at least an information service and may also include others, such as a navigational assistance service or a traffic organization service, or both, defined as follows:

1.1.9.1 An information service is a service to ensure that essential information becomes available in time for on-board navigational decision-making.

1.1.9.2 A navigational assistance service is a service to assist on-board navigational decision-making and to monitor its effects.

1.1.9.3 A traffic organization service is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area.

1.1.10 Allied services - services are services actively involved in the safe and efficient passage of the vessel through the VTS area.

1.1.11 Hazardous cargoes - include:

1.1.11.1 goods classified in the International Maritime Dangerous Goods (IMDG) Code;

1.1.11.2 substances classified in chapter 17 of the IMO International Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC) Code, and in chapter 19 of the IMO International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC) Code;

1.1.11.3 oils as defined in MARPOL Annex I;

1.1.11.4 noxious liquid substances as defined in MARPOL Annex II;

1.1.11.5 harmful substances as defined in MARPOL Annex III; and

1.1.11.6 radioactive materials specified in the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on board Ships (INF) Code.

2 GENERAL CONSIDERATIONS FOR VESSEL TRAFFIC SERVICES

2.1 Objectives

2.1.1 The purpose of vessel traffic services is to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, worksites and offshore installations from possible adverse effects of maritime traffic.

2.1.2 A clear distinction may need to be made between a Port or Harbour VTS and a Coastal VTS. A Port VTS is mainly concerned with vessel traffic to and from a port or harbour or harbours, while a Coastal VTS is mainly concerned with vessel traffic passing through the area. A VTS could also be a combination of both types. The type and level of service or services rendered could differ between both types of VTS; in a Port or Harbour VTS a navigational assistance service and/or a traffic organization service is usually provided for, while in a Coastal VTS usually only an information service is rendered.

2.1.3 The benefits of implementing a VTS are that it allows identification and monitoring of vessels, strategic planning of vessel movements and provision of navigational information and assistance. It can also assist in prevention of pollution and co-ordination of pollution response. The efficiency of a VTS will depend on the reliability and continuity of communications and on the ability to provide good and unambiguous information. The quality of accident-prevention measures will depend on the system's capability of detecting a developing dangerous

situation and on the ability to give timely warning of such dangers.

2.1.4 The precise objectives of any vessel traffic service will depend upon the particular circumstances in the VTS area and the volume and character of maritime traffic as set forth in 3.2 of these Guidelines and Criteria.

2.2 Responsibilities and liability

2.2.1 Where two or more Governments have a common interest in establishing a VTS in a particular area, they should develop a co-ordinated vessel traffic service on the basis of an agreement between them. Where a co-ordinated vessel traffic service is established, it should have uniform procedures and operations.

2.2.2 In planning and establishing a VTS, the Contracting Government or Governments or the competent authority should:

2.2.2.1. ensure that a legal basis for the operation of a VTS is provided for and that the VTS is operated in accordance with national and international law;

2.2.2.2. ensure that objectives for the VTS are set;

2.2.2.3. ensure that a VTS authority is appointed and legally empowered;

2.2.2.4. ensure that the service area is delineated and declared a VTS area; where appropriate, this area may be subdivided in sub-areas or sectors;

2.2.2.5. determine the type and level of services to be provided, having regard to the objectives of the VTS;

2.2.2.6. establish appropriate standards for shore- and offshore-based equipment;

2.2.2.7. ensure that the VTS authority is provided with the equipment and facilities necessary to effectively accomplish the objectives of the VTS;

2.2.2.8. ensure that the VTS authority is provided with sufficient staff, appropriately qualified, suitably trained and capable of performing the tasks required, taking into consideration, the type and level of services to be provided and the current IMO Guidelines on the recruitment, qualifications and training of VTS operators given in annex 2;

2.2.2.9. establish appropriate qualifications and training requirements for VTS operators, taking into consideration the type and level of services to be provided;

2.2.2.10. ensure that provisions for the training of VTS operators are available;

2.2.2.11. instruct the VTS authority to operate the VTS in accordance with relevant IMO resolutions;

2.2.2.12. establish a policy with respect to violations of VTS regulatory requirements, and ensure that this policy is consistent with national law. This policy should consider the consequences of technical failures, and due consideration should be given to extraordinary circumstances that result.

2.2.3 In operating a VTS the VTS authority should:

2.2.3.1 ensure that the objectives of the VTS are met;

2.2.3.2 ensure that the standards set by the competent authority for levels of services and operator's qualifications and equipment are met;

2.2.3.3 ensure that the VTS is operated in conformity with relevant IMO resolutions;

2.2.3.4 ensure that the VTS operations are harmonized with, where appropriate, ship reporting and routeing measures, aids to navigation, pilotage and port operations;

2.2.3.5 consider, where appropriate, the participation of the pilot both as a user and provider of information;

2.2.3.6 ensure that a continuous listening watch on the designated radio frequencies is kept and that all published services are available during the operational hours of the VTS;

2.2.3.7 ensure that operating procedures for routine and emergency situations are established;

2.2.3.8 in a timely manner, provide mariners with full details of the requirements to be met and the procedures to be followed in the VTS area. This information should include the categories of vessels required or expected to participate; radio frequencies to be used for reporting; areas of applicability; the times and geographical positions for submitting reports; the format and content of the required reports; the VTS authority responsible for the operation of the service; any information, advice or instructions to be provided to participating ships; and the types and level of services available. This information should be published in the appropriate nautical publications and in the "World VTS Guide"*.

[* Refer to MSC Circular 586 on the IALA/IAPH/IMPA World VTS Guide.]

2.2.4 The liability element of an accident following compliance with VTS guidance is an important consideration which can only be decided on a case-by-case basis in accordance with national law. Consequently, a VTS authority should take into account the legal implications in the event of a shipping accident where VTS operators may have failed to carry out their duty competently.

2.2.5 Contracting Governments should ensure that ships flying their flag comply with the requirements of vessel traffic services. Those Contracting Governments which have received information of an alleged violation of a VTS by a ship flying their flag should provide the Government which has reported the offence with details of any appropriate action taken.

2.3 VTS services

The following guidance concerning the services that are rendered by a VTS should be taken into account:

2.3.1 The *information service* is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity and intentions of other

traffic; waterway conditions; weather; hazards; or any other factors that may influence the vessel's transit.

2.3.2 The *navigational assistance* service is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies. This service is normally rendered at the request of a vessel or by the VTS when deemed necessary.

2.3.3 The *traffic organization* service concerns the operational management of traffic and the forward planning of vessel movements to prevent congestion and dangerous situations, and is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic. The service may also include establishing and operating a system of traffic clearances or VTS sailing plans or both in relation to priority of movements, allocation of space, mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS authority.

2.3.4 When the VTS is authorized to issue instructions to vessels, these instructions should be result-oriented only, leaving the details of execution, such as course to be steered or engine manoeuvres to be executed, to the master or pilot on board the vessel. Care should be taken that VTS operations do not encroach upon the master's responsibility for safe navigation, or disturb the traditional relationship between master and pilot.

2.3.5 A VTS area can be divided into sectors, but these should be as few as possible. Area and sector boundaries should not be located where vessels normally alter course or manoeuvre or where they are approaching areas of convergence, route junctions or where there is crossing traffic. VTS centres in an area or sector should use a name identifier. The boundaries should be indicated in the appropriate nautical publications and in the "World VTS Guide"*.

[* Refer to MSC Circular 586 on the IALA/IAPH/IMPA World VTS Guide.]

2.4 Communication and reporting

2.4.1 Communication between a VTS authority and a participating vessel should be conducted in accordance with the Guidelines and Criteria for Ship Reporting systems and should be limited to information essential to achieve the objectives of the VTS*. IMO Standard Marine Communication Phrases should be used where practicable.

[* Refer to the Guidelines and Criteria for Ship Reporting Systems, paragraph 2.2, Communication. Resolution MSC.43(64)]

2.4.2 In any VTS message directed to a vessel or vessels it should be made clear whether the message contains information, advice, warning, or an instruction.

2.5 Organization

2.5.1 *Elements of a VTS*

In order to perform the required tasks a VTS organization requires adequate staff, housing, instrumentation and procedures governing operations and interactions between the various elements. The requirements in each field are determined by the particular nature of the VTS area, the density and character of the traffic and the type of service that is to be provided. Consideration should be given to the

establishment of back-up facilities to sustain and maintain the desired level of reliability and availability.

2.5.2 *Tasks that may be performed in accordance with the service rendered*

2.5.2.1 A VTS should at all times be capable of generating a comprehensive overview of the traffic in its service area combined with all traffic-influencing factors. The VTS should be able to compile a traffic image, which is the basis for its capability to respond to traffic situations developing in its service area. The traffic image allows the VTS operator to evaluate situations and make decisions accordingly. Data should be collected to compile the traffic image. This includes:

2.5.2.1.1 data on the fairway situation, such as meteorological and hydrological conditions and the operational status of aids to navigation;

2.5.2.1.2 data on the traffic situation, such as vessel positions, movements, identities and intentions with respect to manoeuvres, destination and routeing;

2.5.2.1.3 data of vessels in accordance with the requirements of ship reporting and if necessary any additional data, required for the effective operation of the VTS*.

[* Refer to the Guidelines and Criteria for Ship Reporting Systems. Resolution MSC.43(64)]

2.5.2.2 Vessel's reports by communication between vessels and the VTS Centre should also be used as a major source of necessary data.

2.5.2.3 To respond to traffic situations developing in the VTS area and to decide upon appropriate actions, the acquired data should be processed and evaluated. Conclusions from the evaluation need to be communicated to participating vessels. A distinction should be made between the provision of navigational information, being a relay of information extracted from the VTS sensors and the traffic image, and the provision of navigational advice, where a professional opinion is included.

2.5.3 *Operating procedures*

Where operating procedures are concerned, a distinction should be made between internal and external procedures. Internal procedures cover operating instruments, interactions among the staff and the internal routeing and distribution of data. External procedures cover interactions with users and allied services. A further distinction should be made between procedures governing the daily routine and procedures governing contingency planning such as search and rescue and environmental protection activities. All operational procedures, routine or contingency, should be laid down in handbooks or manuals and be an integral part of regular training exercises. Adherence to procedures should be monitored.

2.5.4 *Database*

A VTS authority should have, if necessary for the operation of the service, a database with the capacity to retain, update, supplement and retrieve data once collected. Any data retained in a system for

further use should be made available only on a selective and secure basis.

2.6 Participating vessels

2.6.1 Vessels navigating in an area where vessel traffic services are provided should make use of these services. Depending upon governing rules and regulations, participation in a VTS may be either voluntary or mandatory. Vessels should be allowed to use a VTS where mandatory participation is not required.

2.6.2 Decisions concerning the actual navigation and the manoeuvring of the vessel remain with the master. Neither a VTS sailing plan, nor requested or agreed changes to the sailing plan can supersede the decisions of the master concerning the actual navigation and manoeuvring of the vessel.

2.6.3 Communication with the VTS and other vessels should be conducted on the assigned frequencies in accordance with established ITU and SOLAS chapter IV procedures, in particular where a communication concerns intended manoeuvres. VTS procedures should stipulate what communications are required and which frequencies should be monitored. Prior to entering the VTS area, vessels should make all required reports, including reporting of deficiencies. During their passage through the VTS area, vessels should adhere to governing rules and regulations, maintain a continuous listening watch on the assigned frequency and report deviations from the agreed sailing plan, if such a plan has been established in co-operation with the VTS authority.

2.6.4 Masters of vessels should report any observed dangers to navigation or pollution to the VTS centre.

2.6.5 In case of a complete failure of the vessel's appropriate communication equipment the master shall endeavour to inform the VTS centre and other vessels in the vicinity by any other available means of communication of the vessel's inability to communicate on the assigned frequency. If the technical failure prevents the vessel from participation or continuing its participation in a VTS, the master should enter in the vessel's log the fact and reasons for not or further participating.

2.6.6 Vessels should carry publications giving full particulars on governing rules and regulations regarding identification, reporting and/or conduct in the VTS area to be entered.

3 GUIDANCE FOR PLANNING AND IMPLEMENTING VESSEL TRAFFIC SERVICES

3.1 Responsibility for planning and implementing a VTS

It is the responsibility of the Contracting Government or Governments or competent authorities to plan and implement vessel traffic services or amendments to such services.

3.2 Guidance for planning a vessel traffic service

3.2.1 Local needs for traffic management should be carefully investigated and determined by analysing casualties, assessing risks and consulting local user groups. Where the risks are considered VTS addressable, in cases where monitoring of the traffic and interaction between Authority and participating vessel is considered to be essential, the implementation of a VTS, as an important traffic management instrument, should be considered.

3.2.2 A VTS is particularly appropriate in an area that may include any of the following:

3.2.2.1 high traffic density;

3.2.2.2 traffic carrying hazardous cargoes;

3.2.2.3 conflicting and complex navigation patterns;

3.2.2.4 difficult hydrographical, hydrological and meteorological elements;

3.2.2.5 shifting shoals and other local hazards;

3.2.2.6 environmental considerations;

3.2.2.7 interference by vessel traffic with other marine-based activities;

3.2.2.8 a record of maritime casualties;

3.2.2.9 existing or planned vessel traffic services in adjacent waters and the need for co-operation between neighbouring States, if appropriate;

3.2.2.10 narrow channels, port configuration, bridges and similar areas where the progress of vessels may be restricted;

3.2.2.11 existing or foreseeable changes in the traffic pattern resulting from port or offshore terminal developments or offshore exploration and exploitation in the area.

3.2.3 In further deciding upon the establishment of a VTS, Contracting Governments or competent authorities should also consider the responsibilities set forth in 2.2 of these Guidelines and Criteria, and the availability of the requisite technology and expertise.

3.3 Further guidance on vessel traffic services

3.3.1 VTS Authorities should, in the planning of the VTS to be established, make use of available manuals prepared by and published by appropriate international organizations or associations.

3.3.2 The following references should also be consulted for further details:

3.3.2.1 IMO Guidelines and Criteria for Ship Reporting Systems (resolution MSC.43(64))

3.3.2.2 General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants (resolution A.851(20))

3.3.2.3 The IALA vessel traffic services Manual

3.3.2.4 IALA/IMPA/IAPH/World VTS Guide

ANNEX 2

GUIDELINES ON RECRUITMENT, QUALIFICATIONS AND TRAINING OF VTS OPERATORS

PREAMBLE

1 These Guidelines elaborate specifically on 2.2.2.8 of annex 1, which requires the VTS authority to be provided with sufficient staff, appropriately qualified, suitably trained and capable of performing the tasks required, taking into consideration the type and level of services to be provided in conformity with the current IMO Guidelines on the subject.

2 These Guidelines describe the skill and knowledge qualifications required by VTS operators to provide these services. They are intended for application in both planned and existing VTS. They provide guidance in determining how VTS authorities can recruit, select and train personnel in order to carry out their tasks to provide the required VTS standards.

3 These Guidelines do not confer any powers on VTS operators, nor shall they be construed as prejudicing obligations or rights of vessels established in other international instruments.

1 INTRODUCTION

1.1 Background

1.1.1 In recent years, there has been a rapid expansion in vessel traffic services, which has led to a significant increase in the number of VTS operators required world-wide. The services offered by VTSs vary considerably, and range from simple broadcasts of meteorological and hydrological information, through exchange of information to sophisticated navigational advice and, in circumstances where the authority exists, navigation-related instruction.

1.1.2 Investigation of existing services reveals a wide variety of VTS operator entry requirements, ranging from personnel with no nautical background to those with a Master's and/or Pilot's licence. There is an equally wide variation in the type and extent of training provided to VTS operators.

1.1.3 The various levels of knowledge and skill required of the operator, and the standard of training necessary to achieve these levels, have never been fully defined on a world-wide basis. At present there are no internationally recognized qualifications for VTS operators, and the approach to recruitment and training varies widely from country to country.

1.1.4 Given the role of VTS in the provision of safety and efficiency services to shipping and in the protection of the environment, the need to avoid confusion on the part of users travelling from one VTS to another and the importance of professionalism on the part of operators in determining the extent of trust placed in the functioning and effectiveness of a VTS, it is essential that VTS personnel be adequately qualified and trained to carry out their functions, and that the standards for such qualification and training be agreed upon internationally to a large extent.

1.2 Definitions

For the purpose of this annex, the following terms shall have the meanings defined below; however, all other terms used which have

already been defined in annex 1 (Guidelines and Criteria for VTS) shall have the meanings defined therein:

1.2.1 *Advanced training* - training usually carried out at the supervisory level, designed to enhance and utilize the employees' knowledge and experience to the fullest;

1.2.2 *Basic training* - the training required in order to carry out the functions assigned to a position. This type of training requires a high level of supervision;

1.2.3 *Classroom training* - training carried out in a classroom environment that enables trainees to acquire the knowledge and skills necessary to reach the level of proficiency required to fully perform the duties of a position;

1.2.4 *Knowledge* - information about certain facts, theories, systems, procedures and other subject matter relevant to the duties and responsibilities of the position;

1.2.5 *On-the-job training* - training within the work environment which is considered formal and reportable when it involves non-productive person hours; it is instructor- or computer-managed, has specific learning objectives, and has milestones to measure progress. It is structured, has specific resources devoted to or consumed by it, and the trainee within the work environment is relieved of his/her regular or normal duties;

1.2.6 *Operator competence* means having the qualifications essential to effectively and efficiently carry out the functions or sub-functions assigned to a particular VTS operator position;

1.2.7 *Personal suitability* means personal traits and characteristics affecting the application of knowledge and skills in the performance of the duties of the position;

1.2.8 *Qualifications* - education, knowledge, skill, experience or any other attribute which are necessary or desirable for performing the duties of the position;

1.2.9 *Recruitment and selection* - staffing process in which prospective job candidates are identified or considered for a position in terms of their relative suitability for a position based on certain criteria, e.g., knowledge and experience or any other matters that are necessary or desirable having regard to the nature of the duties to be performed. Candidates are selected by conducting examinations, tests, interviews and investigations;

1.2.10 *Refresher training* - training carried out to maintain a certain level of performance, skill in areas or knowledge which are infrequently used and where consequence of non-performance is great;

1.2.11 *Simulator training* - training carried out in an appropriate environment in order to practice skills and perform the duties of the position;

1.2.12 *Skill* - relevant aptitudes or prescribed level of occupational achievements which are basic to the performance of the duties and responsibilities of the position;

1.2.13 *Standards* - criteria, features, methods or processes which are recognized as or agreed to be models for imitation against which like activities will be compared or measured;

1.2.14 *Sub-functions* - specific processes and procedures which are component activities of a particular function;

1.2.15 *Training* - a process of combining instruction and practice to provide employees with the skill, knowledge and experience necessary to perform in their present/future jobs both efficiently and effectively;

1.2.16 *Upgrading training* - training to improve existing skills;

1.2.17 *VTS category* - refers to a means of identifying the type and level of services provided by a VTS based on geographical or organizational considerations. For example, a VTS operating in a port and its approaches could be categorized as a port VTS. A VTS in which participation is required by law could be categorized as a mandatory VTS, as opposed to a voluntary VTS;

1.2.18 *VTS functions* - can be subdivided into internal and external functions. Internal functions are the preparatory activities that have to be performed to enable a VTS to operate. These include data collection, data evaluation and decision making. External functions are activities executed with the purpose of influencing the traffic characteristics. They relate to the primary traffic-management functions of rule-making, allocation of space, routine control of vessels and manoeuvres to avoid collisions, as well as to other management functions such as enforcement, remedial and ancillary activities. The reasoning behind these traffic-management functions and their relationship to the VTS services is set out in paragraph 6.4;

1.2.19 *VTS operator* - a VTS operator is an appropriately qualified person performing one or more tasks contributing to the services of the VTS. However, for the specific purposes of these Guidelines, VTS operator further means a person who provides, if duly authorized, instructions and information to vessels and decides what action should be taken in response to data received. This person may be directly responsible for communications within a defined geographical area within a VTS area, or may relay such information and decisions through an intermediary; and

1.2.20 *VTS operator position* - a position in a specific VTS from which a VTS operator carries out the VTS functions as defined for purposes of these Guidelines.

2 OBJECTIVES AND AUTHORITY

2.1 Objectives

2.1.1 The objectives of these Guidelines are:

2.1.1.1 to provide authorities with a logical process to follow in selecting and recruiting VTS operators, and in establishing qualification and training standards which will ensure that the necessary knowledge and skill profiles exist to enable them to carry out their functions to appropriate standards; and

2.1.1.2 to establish knowledge and skill requirements and standards which VTS operators should meet with respect to certain functions.

2.2 Competent authority

2.2.1 Subject to their own national and local requirements and constraints, authorities will need to establish training requirements for their VTS operators. Authorities will also need to set specific knowledge, skill and personal suitability standards which operators must meet. Nothing in these Guidelines

derogates from that power or imposes any obligation on authorities.

2.2.2 These Guidelines should not be construed as conferring any additional power on authorities with respect to the operation of a VTS outside territorial seas.

3 FRAMEWORK

3.1 Explanation of framework

3.1.1 These Guidelines provide a framework within which authorities can meet their obligations as laid down in annex 1 to provide VTS operators with the competence to carry out their designated functions, independent of the level of qualifications of personnel recruited.

[*See complete Resolution for framework as shown in figure 1*]

3.1.2 The framework outlines the steps that should be taken by a VTS authority to ensure that its VTS operators are competent to carry out assigned tasks. These steps are in two stages:

3.1.2.1 Stage 1:

Preliminary steps to be able to take decisions relative to operator competencies (prerequisites for the system).

3.2.1.2 Stage 2:

Steps to ensure that operators possess or achieve, and then maintain, the level of competence required to carry out their assigned functions (system parameters).

3.1.3 In order to implement the steps outlined above, VTS authorities must be prepared to bring to bear certain competencies which are normally available to them. Specifically, input is required from VTS operations and from training and human resources expertise in order to successfully design and implement a programme to match VTS operator competencies with operational need.

[*See complete Resolution to see the particular areas where such expertise is required are indicated - figure 1*]

4 PREREQUISITES FOR THE SYSTEM

4.1 In order to be able to identify, develop and implement a system for VTS operator qualification and training, authorities should first take a number of preliminary steps in order to ensure that the operator's competencies are appropriately aligned with the functions for which he/she is responsible. These steps are as follows:

4.1.1 Implementing a VTS - make a decision, or have made a decision to implement a VTS.

4.1.1.1 Identification of VTS functions - identify and describe the detailed functions relevant to the given VTS. These detailed functions have been developed from the general VTS functions described in 2.3 and 2.5 of annex 1.

4.1.1.2 Organization of VTS centre functions - organize the functions according to how they are to be carried out in accordance with the organization of the internal VTS operation.

4.1.2 Establishment of VTS operator positions - be prepared to establish, or have already established, operator positions

within a VTS, determine what functions will be carried out from which positions, and be prepared to ensure that there will be personnel occupying those positions who have been given responsibility for carrying out the identified functions.

4.2 Plans for recruitment and selection of VTS operators can be developed once these steps have been completed.

5 SYSTEM PARAMETERS

5.1 General

5.1.1 The views of authorities on recruitment qualifications may vary between a preference for a low qualification entry requiring a high degree of training, to a preference for a high qualification entry requiring a low degree of training. Clearly, if a high entry qualification is combined with relevant local experience, training requirements will be minimized.

5.1.2 Ideally, authorities should have the ability to specify the background and prior experience a VTS operator should have, but due to circumstances, this is often beyond their control. They should, however, be able to specify the level of skill and knowledge that a recruit must have achieved based on this prior experience (e.g., master mariner, top level air traffic controller).

5.1.3 VTS authorities should therefore establish methods of assessing the skill and knowledge of recruits and existing VTS operators relative to the requirements of the tasks or functions they perform.

5.1.4 Depending on the skill and knowledge levels previously acquired, and the tasks or functions to be performed, authorities may need to supplement existing qualifications with appropriate training to make up any deficiencies.

5.2 Recruitment and selection

5.2.1 Authorities should establish entry standards for new VTS operators coming into the system in terms of prior skills, knowledge, and personal suitability characteristics relevant to the tasks or functions they will be required to perform. These skills and knowledge may in part be assessable through existing qualifications (e.g., master or pilot's licence).

5.2.2 VTS authorities may wish to consider introducing additional screening mechanisms to ensure that recruits have the necessary aptitudes, personal suitability characteristics, and ancillary skills for the functions they will be assigned. These mechanisms will assess, inter alia, ability to meet medical standards commensurate with the working conditions of the VTS position in question, spatial problem-solving capabilities and other job-related aptitudes, ability to work under pressure; and language capability required for the particular VTS.

5.3 Qualifications

5.3.1 Authorities must be able to determine what competencies a VTS operator must possess to carry out assigned functions, in order to establish the combination of prior qualifications and subsequent training required to ensure that their operators are competent.

5.3.2 To this end, they should analyse in detail the tasks which the operator will have to carry out in order to accomplish the specified functions, in terms of the skills and knowledge which he/she must possess to implement them successfully.

5.3.3 Having carried out the task analysis, authorities must specify the types of skill and knowledge which operators must possess in order to perform their functions. These skill and knowledge components should relate directly to the functions to be performed, and should be specified in such a way that authorities will be able to determine whether:

5.3.3.1 VTS operators possess them in terms of their prior qualifications and experience; or

5.3.3.2 whether additional training will be needed to provide them.

5.3.4 Once the necessary types of skill and knowledge have been established, authorities should determine to what level they must be possessed by a VTS operator. Authorities therefore have a responsibility to establish performance standards for skill and knowledge types to be acquired.

5.3.5 Because not all VTSs carry out the same range of functions, and because some operators may only carry out limited functions within a particular service, authorities may be required to identify different knowledge and skill levels for operators based on the tasks they perform in the VTS in which they work.

5.4 Training

5.4.1 Where the types and/or levels of skill and knowledge possessed by a VTS operator, by virtue of his or her prior experience and qualifications, do not fully conform to those required in order to carry out assigned tasks, authorities should provide compensatory training in areas of deficiency.

5.4.2 Authorities should establish concomitant training standards for those areas where they train VTS operators to the proficiency requirements of their positions. These training standards should form the basis of any training programme to be developed and delivered to VTS operators.

5.4.3 Based on the training standards, authorities should then be prepared to develop and implement a training programme which, when taken together with relevant existing experience, will provide the VTS operator with necessary skills and knowledge to perform his/her tasks to the required standards.

5.4.4 There are a variety of mechanisms by which training can be carried out. These include training provided by authorities directly, contracted-out training or any other training establishment common to interested Administrations, which trains VTS operators for a number of authorities.

5.4.5 Authorities may also wish to consider the need to provide different types of training, with different levels relative to each type, in order to ensure the acquisition and maintenance of the relevant skills and knowledge necessary to meet job requirements, according to the following matrix:

TYPE OF TRAINING LEVEL OF TRAINING	CLASSROOM	SIMULATOR	ON-THE-JOB
BASIC	X	X	X
ADVANCED	X	X	X
UPGRADING	X	X	X
REFRESHER	X	X	X

Authorities should be aware of the advantages of a modular approach to training for ease and cost-effectiveness of training delivery.

5.4.6 Authorities may wish to institute a system of examinations to determine whether or not operator experience, qualifications and training are resulting in performance to required standards.

5.4.7 Once suitably qualified and trained employees are performing on the job, their performance must be observed and monitored to ensure that it continues to meet the established standards.

5.4.8 Authorities should be aware that for an operator to carry out VTS functions effectively, training may be required in areas not specifically related to VTS (e.g., typing, supervisory skills), and which are not specifically covered in these Guidelines.

5.5 Certification

Authorities may wish to introduce a formal system of certification as a means of ensuring and demonstrating to system users that a mechanism is in place which matches employee competence with task requirements.

6 DETERMINING SKILL AND KNOWLEDGE REQUIREMENTS ASSOCIATED WITH VTS FUNCTIONS

6.1 The process used to determine the knowledge and skill types and levels required by VTS operators to carry out specific VTS functions is outlined below. It can also be used by authorities to determine how they might wish to establish the difference between skill and knowledge levels required of VTS operators on recruitment (prior qualifications) and those which will be provided after recruitment (training). Additionally, it can be used to determine the type and degree of training which should be provided to operators already employed by VTS and who may possess some form of prior qualification.

NOTE: It must be noted by authorities that this process is a model only. Authorities wishing to make use of this process must keep in mind that it will need to be adapted to meet their specific local requirements.

Also, because it is not a mathematical model, authorities must also keep in mind the importance of the human decision-making function, which cannot be scientifically measured, and therefore cannot be completely addressed in this process.

Consequently, in determining skill and knowledge types and levels for VTS functions, authorities will need to decide on the level of freedom VTS operators will have in making decisions based on judgement.

6.2 The general process for determining skill and knowledge requirements is as follows:

6.2.1 define terms and identify functions to be considered. Functions or sub-functions may be classed as H(igh) or L(ow) to indicate the involvement of VTS operators;

6.2.2 divide functions identified into sub-functions. This process of subdivision will be continued as long as necessary to identify the skill and/or knowledge requirements necessary on the part of the VTS operator in order to perform the function. The results of this breakdown will be a list of skill and knowledge components, all of which are detailed actions to be performed, the sum of which constitutes carrying out the function

[See complete Resolution where *this process is illustrated in figure 2 and an example of it shown in figure 3*];

6.2.3 at the final level of sub-division, make each component action sufficiently detailed to enable it to be classified as either skill or knowledge to be performed; and

6.2.4 review and verify that sub-division is complete.

6.3 Once the individual component actions have been classified in this manner, the level of skill or knowledge required for their performance will then be evaluated. The following criteria will be used, on a weighted basis:

6.3.1 frequency - how often the task is performed;

6.3.2 percentage of time used in performance of the task relative to other tasks;

6.3.3 value - importance of the particular skill or knowledge in the performance of the task, whether "must know" (mandatory), "should know" (important), or "nice to know" (optional);

6.3.4 liability - consequence of error or omission during the performance of a function;

6.3.5 performance standard - how well must the individual perform in the conduct of the task and the learning difficulty associated with it;

6.3.6 verification and intervention - whether the individual can perform the task with or without supervision;

6.3.7 performance tools - equipment and established procedures involved in the implementation of the function; and

6.3.8 reasons why the performance of the task is important.

Skills involved include, but are not necessarily restricted to: ability to operate communications and surveillance equipment; ability to do chart work; ability to provide navigational assistance; and ability to operate ancillary equipment such as telephones, telex, tide and meteorological equipment. Examples of knowledge which may be required include: local geography; principles of navigation; applicable acts, regulations, agreements and publications; communications procedures and vocabulary*; principles of organization of vessel traffic.

[* Refer to the Standard Marine Navigational Vocabulary as replaced by the IMO Standard Marine Communication Phrases (currently under trials)]

6.4 In the definition in 1.2.18 a number of traffic management functions have been identified. A VTS can play an important role in the execution of these functions, which may be taken as the

basis for the process described in 6.1 to determine the skill and knowledge types and levels for VTS operators contributing to the execution of traffic-management functions. The objectives of traffic-management functions and their relationship to the VTS services are briefly described below:

6.4.1 *Internal VTS functions*:

- data collection; and
- data evaluation/decision making.

6.4.2 *Traffic management functions*:

6.4.2.1 *Primary function*:

- allocation of space. This is effecting separation in space and/or time between vessels, or certain categories of vessel, by forward planning. It is a strategical function that can be performed by a traffic organization service;
- routine control of vessels. This is a shipboard process to which a VTS contributes by supplying data relevant to the navigational decision-making process on board. This function relates to an information service and/or a navigational assistance service;
- manoeuvres to avoid collisions. This is a shipboard function concerning ships in encounter situations. It may be assisted by a VTS. It is a tactical function and relates to an information service and/or a navigational assistance service.

6.4.2.2 *Enforcement function*

The objective of this function is to encourage and monitor adherence to applicable rules and regulations and to take appropriate action where required and within the authority of the VTS. Some aspects of this function might be covered by a traffic organization service.

Remedial functions

These functions are aimed, primarily, at reducing the effects and consequences of incidents, such as search and rescue, salvage and pollution. These functions may be performed by a VTS in support of allied activities.

Other functions

These functions relate to co-ordination and liaison between vessels and third parties. They may be performed by a VTS as support of allied activities.

FURTHER READING and BIBLIOGRAPHY

- Nautical Institute: *Work of The Harbour Master*
- Bureau Veritas: *Safety at Sea - Policies, Regulations and International Law*
- IMO: *Resolution A.857(20) - Guidelines for Vessel Traffic Services together with Annex 1 Guidelines and Criteria for VTS and Annex 2 Guidelines on Recruitment, Qualifications and Training of VTS Operators*
- *The International Regulations for the Prevention of Collisions at Sea (Col Regs)*
- UK DETR: *Port Marine Safety Code* and *A guide to good practice on Port Marine Operations*
- United Nations: *1982 Law of the Sea (LOS) Convention*
- IALA: *Recommendation V-103 (May 1998) - Standards for Training and Certification of VTS Personnel*
- IALA: *VTS Manual*
- IALA: *IALA/IAPH/IMPA World VTS Guide*
- *Merchant Shipping (Prevention of Oil Pollution) Regulations 1996*
- *Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1990*
- Compuship: *Recent Developments in VTS*
- Maritime VTS - *http://www.maritime-vts.co.uk*
- VTS San Francisco - *http://www.uscg.mil/d11/vtssf/index.htm*
- Turkish Maritime Pilots Association - *http://www.turkishpilots.org/*